

AMENDMENTS TO THE CLAIMS

Claim 1 (Currently amended) An extrusion-free wet cleaning process for post-etch 5 Cu-dual damascene structures, the process comprising:
 providing a wafer comprising a silicon substrate and at least one post-etch Cu-dual
 damascene structure, the post-etch Cu-dual damascene structure having a via
 structure exposing a portion of a Cu wiring line electrically connected with an
 N⁺ diffusion region of the silicon substrate and a trench structure formed on the
 via structure;
 executing an oxidation step by applying a diluted H₂O₂ solution to the wafer to
 slightly oxidize the surface of the exposed Cu wiring line; and
 10 washing away cupric oxide generated in the oxidation step by means of a cupric
 oxide cleaning solution containing diluted HF, NH₄F or NH₂OH having a pH of
 15 above 7.5 and
preventing Cu reduction reactions on the N⁺ diffusion region connected Cu wiring
line.

Claim 2 (Original) The process of claim 1 wherein the Cu wiring line electrically 20 connected with an N⁺ diffusion region of the silicon substrate serves as a cathode in
 the cupric oxide cleaning solution.

Claim 3 (Original) The process of claim 1 wherein the method of preventing Cu reduction 25 reactions on the Cu wiring line comprises purging inert gas onto the wafer during
 the application to the wafer of the diluted H₂O₂ solution.

Claim 4 (Original) The process of claim 1 wherein the method of preventing Cu reduction 30 reactions on the Cu wiring line comprises adding a Cu corrosion inhibitor to the
 diluted H₂O₂ solution.

Claim 5 (Original) The process of claim 4 wherein the Cu corrosion inhibitor comprises 35 benzotriazole (BTA).

Claim 6 (Currently amended) The process of claim 1 wherein the method of preventing
 Cu reduction reactions on the Cu wiring line comprises reducing the H₂O₂
 concentration of the diluted H₂O₂ solution to below 100:1 (v/v) of solvent to H₂O₂.
 40

Claim 7 (Original) The process of claim 1 wherein the method of preventing Cu reduction
 reactions on the Cu wiring line comprises lowering the temperature of the diluted
 H₂O₂ solution to below 15°C during the application to the wafer of the diluted H₂O₂
 solution.

Claim 8 (Cancelled)

5 Claim 9 (Currently amended) A wet cleaning process comprising:
 an oxidation step comprising a means for reducing Cu deposition on a cathode-like copper wiring line of a Cu-dual damascene structure, wherein the means for reducing Cu deposition on a cathode-like copper wiring line comprises a step of purging an inert gas during the oxidation process; and
 an oxide etch step for washing away cupric oxide generated in the oxidation step by means of a cupric oxide cleaning solution; and
 reducing Cu deposition on a cathode-like copper wiring line of a Cu-dual damascene structure.

10 Claim 10 (Original) The process of claim 9 wherein the oxidation step is used to slightly oxidize a surface of a Cu wiring line in a dual damascene structure by utilizing a diluted H₂O₂ solution.

15 Claim 11 (Original) The process of claim 9 wherein the cupric oxide cleaning solution comprises diluted HF, NH₄F, NH₂OH, or diluted HF/HCl.

20 Claim 12 (Original) The process of claim 9 wherein the oxide generated in the oxidation step comprises CuO_x and Cu(OH)₂.

25 Claim 13 (Original) The process of claim 9 wherein the cathode-like copper wiring line is electrically connected with an N⁺ diffusion region of a silicon substrate.

30 Claim 14 (Cancelled)

35 Claim 15 (Original) The process of claim 9 wherein the process of reducing Cu deposition on a cathode-like copper wiring line comprises adding a Cu corrosion inhibitor to the diluted H₂O₂ solution.

40 Claim 16 (Original) The process of claim 15 wherein the Cu corrosion inhibitor comprises benzotriazole (BTA).

45 Claim 17 (Currently amended) The process of claim 9 wherein the process of reducing Cu deposition on a cathode-like copper wiring line comprises reducing the H₂O₂ concentration of the diluted H₂O₂ solution to below 100:1 (v/v) of solvent to H₂O₂.

Bl
Cut

35 Claim 18 (Original) The process of claim 9 wherein the process of reducing Cu deposition on a cathode-like copper wiring line comprises lowering the temperature of the diluted H₂O₂ solution during the oxidation step to below 15°C.

40 Claim 19 (Original) The process of claim 9 wherein the process of reducing Cu deposition on a cathode-like copper wiring line comprises increasing the pH of the cupric oxide cleaning solution to above 7.

45